

## **Reaction-time and attention in the hypnotic state / [G. Stanley Hall].**

### **Contributors**

Hall, G. Stanley 1844-1924.  
Royal College of Surgeons of England

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## REACTION-TIME AND ATTENTION IN THE HYPNOTIC STATE.

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IN the autumn of 1881, a series of public exhibitions was given in Boston by an itinerant "mesmeriser" who was attended from city to city by a remarkable hypnotic subject whom we will designate as A. B. He was about 30 years of age, an extreme blonde, with narrow and retreating chin and protuberant brows, a cabinetmaker by trade, of fair intelligence and physical development, the head of a small family, and, he said, prone to sleep-walking from boyhood. Physicians and others elsewhere by whom he had been manipulated, had directed their attention almost solely to the determination or demonstration of the reality of his abnormal state, and had repeatedly used to this end such drastic tests as in the normal state cause considerable pain. Pistols had been discharged near his ear, sharp instruments thrust into his body, caustic substances applied to the sensitive parts of the mouth and nostrils, and strong electric shocks given through various parts of his body, so that it was with difficulty and only by promising to abstain from everything painful and unpleasant, by allowing him to bring a friend to watch me, and by a small pecuniary compensation, that he was induced to visit the laboratory at appointed intervals.

Dr. James Braid, as is well known, explained most of the phenomena to which he gave the name of hypnotism as due, not to odic or mesmeric or vital force or to any influence which came from without or passed beyond the limits of the human body, but only to an unusual degree of "concentration of Attention" variously directed by suggestions of many kinds. Although confessedly not a psychologist, he believed he had succeeded in showing that nothing transcendent but only subjective phenomena were involved, and quotes approvingly a statement describing his work in this field as a study of the "pathology of attention". The important researches of Heidenhain in Germany, though perhaps fortunately conducted without full understanding of Braid's results, and though fruitful and suggestive in the highest degree, were not long continued after Bürger demonstrated that all his effects upon hypnotic subjects might be produced by suggestion without any

material stimuli<sup>1</sup> or physical contact. Although G. Schneider has distinctly asserted that the psychological cause of hypnotism must be found in attention, Dr. G. M. Beard of New York has urged this theory more radically and consistently than any one since Braid, in 1877 and in a number of publications since. On the other hand, the opinion has been expressed in nearly all of the many recent studies of Reaction-time or the Personal Equation, that the most effective way of reducing this was by a strong concentration of attention upon the expected stimulus and the intended reaction. Although fatigue, practice, and strength of the stimulus are co-factors in determining reaction-time, it is thought that by opening certain nerve-tracts or by preparatory innervation of the reacting muscles, the attention acts as a special agent in this acceleration.<sup>2</sup> Thus it had long seemed desirable to submit the hypnotic to the test of the physiological theory of attention. To this end the first object with A. B. was to determine the simple reaction-times in the normal and in the abnormal state respectively.

For this purpose the following arrangement of apparatus was found serviceable. The primary electric current was made to pass through a Halske hammer in such a way as to be interrupted whenever the finger of the operator broke the contact with the platinum-point of the screw, by pressing down the spring which held the lever against it. The breaking of this primary circuit released a steel rod vibrating 107 times per second, which had been drawn and held in a slightly bent position by a magnet in the same circuit, and at the same instant gave a distinct shock to the left forefinger of the hypnotic subject through a secondary or alternative circuit (*Nebenschliessung*). He was directed to press the lever of a relay key with his right forefinger (which closed the primary current and arrested the vibration of the rod by drawing it firmly to the magnet again), as soon as possible after feeling the shock in the left forefinger, having been placed in another room that he might not hear the click of the operator's key and react from a quicker perceived auditory impression. Thus the time during which the rod was vibrating would represent the reaction-time desired. To record these vibrations a tinsel pen was fastened to the end of the rod and allowed to play upon the surface of a hori-

<sup>1</sup> See Note entitled "Recent German Researches on Hypnotism," by the writer (MIND XXI. 98), for digest and literature of these researches up to the date of writing.

<sup>2</sup> Cf. *inter alia*, Wundt, *Grundz. der Physiol. Psychologie*, 2te Aufl. ii. 226, and Hermann, *Handb. der Physiologie*, ii. 286, &c.

zontal Marey drum covered with smoked glazed paper, the magnet and vibrating rod being supported on a Marey screw sledge apparatus, and this moved slowly from one end of the drum to the other by a band connecting wheels on the axes of the drum and the screw of the sledge respectively. Thus it was possible to record 40 or 50 reactions without stopping the apparatus.

After the first series of reactions in the normal state had been taken, and a few minutes allowed for rest, it was with some anxiety that I saw the attendant make the necessary "passes" and seat A. B. again before the apparatus. Previous subjects had not been able to hold their attention to the work of making the reactions, or failed to comprehend what was wanted, or passed from the abnormal state into a state closely resembling sleep, and soon ceased to react at all. A. B., however, after a time, not only reacted to every stimulus in a series of from 40 to 50, but pressed down the key with the right forefinger with increasing energy till towards the end of the series this movement became prolonged, violent and almost crampy, the reaction-time, however, not differing essentially from the first to the last part of the series. After he was roused, 15 minutes were allowed for rest before a final series of reactions in the normal state was made. The following table presents the average reaction-time for three observations made on successive weeks and recorded in vibrations of a rod swinging, as was above stated, 107 times per second:—

TABLE I.

NORMAL REACTION-TIME.		ABNORMAL REACTION-TIME.		NORMAL REACTION-TIME.		Average time of the two normal series.	Number of the series of observations.
Number of reactions.	Average reaction-time in vibrations.	Number of reactions.	Average reaction-time in vibrations.	Number of reactions.	Average reaction-time in vibrations.		
31·0	32·3	50·0	20·7	39·0	42·0	37·1	I.
22·0	44·2	49·0	18·3	35·0	39·1	41·6	II.
36·0	29·0	49·0	23·1	28·0	31·0	30·0	III.
	35·1		20·7		37·3		
	0·328		0·193		0·348	Average time in the three series in seconds.	

From this table it appears that the reaction-time, though reduced in the abnormal state from 33 to 19 hundredths of



a second, is by no means extremely small. With scientific men who have measured their reaction-time from hand to hand in a similar way, the results vary from 108 to 191 thousandths of a second.<sup>1</sup> But for one presumably not practised either in such reactions or in fixing the attention very long or sharply the result is noteworthy.

Scarcely less so is the following table of average errors, in which all those reaction-times in excess of the average reaction-time are themselves averaged in the plus column, and those less than the average reaction-time are averaged in the minus column, no account being taken of those few cases in which the time of a single reaction chanced to coincide with the average time of the entire series :—

TABLE II.

NORMAL.		ABNORMAL.		NORMAL.		No. of the series of observations. <i>Cf.</i> Table I.
+	—	+	—	+	—	
8·7	8·5	9·8	3·2	15·5	7·6	I.
18·5	14·8	3·5	3·4	9·6	11·7	II.
7·1	7·6	12·0	3·8	5·5	5·2	III.

The most obvious result from this table is the very slight variation of the minus average error, amounting to but  $\cdot 032$  of a second, and indicating an approximation to a limit or minimal value not apparent in the reaction of the normal state. In the abnormal state the reaction-times are much more uniform than in the normal state, and the reactions in excess of the average time are few, and their excess correspondingly great, while in three or four individual reactions the time is reduced almost to one tenth of a second. In the second observation, when the sleep seemed soundest and the reaction-time was least, the average error in excess was also very small, suggesting the possibility that the few slow reactions which so increased the average reaction-time in the first and especially the third observation were due to ineffective tendencies to awake. 329 reactions, however, are too few to base any conclusive inferences upon, and at this point our subject and his "mesmeriser" whom he attended went to a distant city, and no suitable subject has yet been found on which to continue our observations.

<sup>1</sup> See Hermann's *Handbuch der Physiologie*, ii. 263.

Along with these observations another series of studies of simple Association-time, suggested by the methods of Galton<sup>1</sup> and Wundt,<sup>2</sup> was begun upon A. B. and another hypnotic subject. Lists of familiar monosyllabic words were carefully prepared beforehand in perpendicular columns on long strips of paper. When the hypnotiser pronounced a word in this list, the hypnotised subject was directed to think *as quickly as possible* of any other word suggested by it, and pronounce it while an observer recorded as nearly as possible upon the revolving drum the instant when the hypnotiser's word and the subject's response respectively were heard, that the "association-time" might afterwards be measured by subtracting from the total interval the time occupied in reacting upon the simple apprehension of the hypnotiser's word. In these experiments it has been assumed that the first word suggested to the subject's mind by the word thus sprung in upon his consciousness will lie along the track of easiest, quickest, or most automatic association, which track would be left for less frequented lines, somewhat in proportion to the time taken for deliberation or for choosing between several words simultaneously suggested by the "call-word". Indeed Galton intimates that his method lays bare the habitual ruts of thought in a way which exposes mental character to an often embarrassing extent. In the way above described, and by having one long familiar with the subject to control him, as far as it was possible to be done for this purpose, A. B. was caused to react on 40 words in the normal, and then on as many more in the abnormal state, reversing this order (*i.e.*, pronouncing to the subject in the normal the same list of words that had before been given in the abnormal state and *vice versa*), at the next sitting, three or four days later, and numbering each word and series on the revolving drum in correspondence with the order of words in the lists, so as later to connect with each reaction its time.

The list comprised about 340 words, yet the simple observations, though more numerous than those of either Wundt or Galton, seem to the writer far too few to warrant any definite inferences as to the question chiefly contemplated at the outset, *viz.*, What are the laws or categories, and what is the time of the various kinds of association in the normal and abnormal states respectively. Another negative result was that, except in time, no greater difference appeared between two successive reactions from the same list of words

<sup>1</sup> *Brain*, July, 1879, p. 149, *et seq.*

<sup>2</sup> Dr. M. Trautsholdt, in Wundt's *Philosophische Studien*, i. 2. s. 229.

whether the subject was in the same state during both series or in the normal state during one series and in the abnormal state during the other. An exception to this generalisation, however, may be noted in the case of a third finical subject who affected latinisms in the normal state, responding, *e.g.*, to the series 'saw,' 'drive,' 'file,' 'church,' 'pew,' by 'divide,' 'advance,' 'wear away,' 'clergyman,' 'occupant,' respectively when normal, and by 'board,' 'go,' 'nail,' 'pew,' 'sit,' when hypnotised. In both states in all subjects a strong tendency was noted, amounting to at least 24 per cent. of the whole number of reactions, to follow the sentence-order in associating words. 'Sit,' *e.g.*, was responded to by 'down,' 'eat' by 'enough,' 'late' by 'come,' 'rail' by 'road,' 'lag' by 'behind,' 'paint' by 'brush,' 'kill' by 'don't,' 'sleep' by 'sound,' &c. Next in frequency, both in the normal and in the abnormal series—amounting, as approximately as such classification could be made, to 14 per cent. of all—were what may be called the associations of common life: *e.g.*, 'speak' 'read,' 'hot' 'cup,' 'toe' 'foot,' 'sleep' 'bed,' 'write' 'pen,' 'sun' 'moon,' 'dine' 'supper,' 'fat' 'tallow,' &c. Another category of some 8 per cent. is alliterative or rhythmic: *e.g.*, 'slice' 'lice,' 'rage' 'range,' 'gape' 'gob,' 'dough' 'door,' 'scrap' 'strap,' 'just' 'joint,' &c. These seemed to predominate slightly in the abnormal state.

This latter state, however, presented some unlooked-for peculiarities. Nearly 5 per cent. of the words given in the abnormal state elicited no response whatever, the subject apparently not hearing them, though they were spoken distinctly and near his ear. These words—'sit,' 'wish,' 'tie,' 'tell,' 'right,' 'hate,' 'skin,' 'throw,' 'thick,' present no obvious difficulties, and were responded to readily enough in the normal state, as indeed were some of them which chanced to be repeated in a subsequent abnormal state. Again, 2 per cent. of the words in the abnormal state were simply repeated, as naively as though that were what was required, although this was not once observed in the normal state. A tendency was also observable to repeat a responsive word several times in a series of reactions, whenever it would fit, and in the case of one subject when it was quite inappropriate. In a series of 23 words, *e.g.*, 'change,' 'break,' 'run,' 'hold,' 'speak,' were all responded to by '*fast*'. In a series of 18 words, 'wife,' 'drink,' 'lug,' and 'lick' were all responded to by '*up*'. The second subject responded to 'pound,' 'bite,' 'toil,' 'kick,' 'stick,' 'send,' and 'our' alike by '*hard*'—these words occurring within a series of 26 words. Again, 'stoop,' 'rest,' 'low,' 'verb,' 'fault,' 'hatch,' were all

responded to by 'high'. Occasionally no coherence whatever between the call-word, and the response was apparent in the abnormal state—*e.g.*, 'Alps' 'me,' 'art' 'you,' 'glass' 'boot,' &c. Not unfrequently the articulation was imperfect, and the abnormal reactions were so quick that sometimes the latter part of the word was not heard. 'Sword,' *e.g.*, was understood 'sew,' and the response was 'needle'; 'ripe' was heard as 'rye,' and the response was 'wheat'; 'like' was heard as 'light,' and the response was 'dark'. When several words are pronounced alike, or when one word has several connotations, the tendency was observed in both states to prefer the more material or sensuous meaning except when this tendency was overruled by the influence of analogy with other words near it in the series. When, *e.g.*, the preceding word was 'post,' 'not' was apperceived as 'knot,' as appears from the reaction 'pine,' but when 'will' had just preceded, 'knot' was taken as 'not,' and the reaction was 'why'. The words 'lie' and 'kill,' happening to come near the end of one abnormal series, seemed to excite A. B. as if they caused dreams of scenes in which he was concerned with actions represented by these words. Finally, it may be mentioned that in all the word-reactions, as in all the simple reactions, the reaction-time was shorter and more uniform in the abnormal than in the normal states.

In discussing these results, it seems first that fresh ground is gained for confidence in only those methods which enable all phenomena of this class to be studied without taking the character of the subject into account. It is true that no one can define the field for possible conscious imposition and fraud with absolute certainty, but on the other hand the best men are very easily deceived, and when the experience to be interpreted or narrated presents anything unusual, the strongest subjective conviction is anything but scientific. When, as in the Breslau researches, the axes of the two eyes are made to diverge, one to roll up and the other down; when all the complex phenomena of colour-blindness tested by the subtlest methods are consistently produced in one eye, the other remaining normal; when a normal eye suffers an accommodation-cramp so intense as to read very fine print at a distance of an inch from the anterior surface of the cornea; when ignorant working-men write backwards or pronounce long sentences which are repeated to them in a foreign language; and when the sense of dizziness from whirling about seems mainly abolished,<sup>1</sup>—the reality of an

<sup>1</sup> See Dr. Beard's letter in an article on "The Sense of Dizziness in Deaf-mutes," by Prof. W. James, *Amer. Journal of Otology*, iv. (Oct., 1882), 15.

abnormal state of some kind cannot be disputed. So, too, when A. B. can and does reduce his reaction-time as in Table I. at the first sitting, and can gaze at a large sunny window with dilated pupils for 13 minutes without winking, and produce the other self-consistent and uniform results given above, we consider the test of the reality of an abnormal state of some kind to be better than the unflinching endurance of torture which we know to be possible with a strong will, or even than the testimony of the best men or the most respectable citizens.

The general phenomena of Attention are familiar to all both subjectively and in its more common physical effects. It is well known that the reproduction of anything similar to an expected object facilitates our perception of it, as in the oft-mentioned facts that we recognise a new word quicker if told what language it is in, or a very dimly remembered face if told where we have met it before. Expectation develops many and often unsuspected aids in apprehension, while the new or unexpected always meets more or less opposition or delay in reaching consciousness. Since the suggestive dissertation of Herbart<sup>1</sup> in 1822, attention has come to play a very important rôle with psychologists, with whom it has had much to do in undermining the theory of faculties, until, as is known, with Wundt it may be called the central psychic category. Though not, as several writers have lately asserted, entirely identical with apperception, which Steinthal and Lazarus make no less central in folk-psychology, it has many elements in common with it. Thus in the literature of philology and physiology, as well as in insanity, popular delusions, and education, it has come to occupy an important place. Dr. G. Buccola has lately shown<sup>2</sup> that cultured people react more quickly than the uncultured, and that the personal equation of idiots and the insane (who can rarely be hypnotised) is greatly prolonged. This latter he thinks due to distraction or defective power of voluntary attention, and he believes that only men of more or less mental power can be hypnotised. Dr. Beard,<sup>3</sup> who has

<sup>1</sup> *De Attentionis mensura causisque primariis*, in *Werke*, vii. 75.

<sup>2</sup> "La durata del discernimento e della determinazione volitiva," in *Rivista di Filos. scientif.*, i., 2, p. 19.

<sup>3</sup> See *Nature and Phenomena of Trance*, by G. M. Beard, M.D. (G. P. Putnam's Sons, N.Y.) On p. 31 is a list of the author's many publications on this subject. See also *Muscle-Reading* by same author, 1882. For further notices of the more important literature on this subject see Appendix to Prof. Ch. Bäumler's *Der sogenannte animalische Magnetismus oder Hypnotismus*, Leipzig, 1881. Also a still fuller list in G. P. Möbius, *Ueber den Hypnotismus*, Leipzig, 1881.

distinguished very clearly between the positive and negative field of hypnotic attention, compares common consciousness to a large chandelier with all its jets lighted, but burning dimly, while inducing the hypnotic state is like turning off all the jets but one, which burns all the more brightly. If these general views be correct, no one can deny its great importance for all departments of psycho-physics and education; for if psychic processes, or any considerable number of them, be reactions "delayed only for compounding," it suggests no less a problem than that of a virtual prolongation of human life, so far as it is made up of these reactions. Upon the Attention-hypothesis a great number of neural disorders are seen to be only exaggerations of states familiar to every normal mind, and we are enabled to throw overboard at once a formidable array of names and hypotheses which have long obscured and discredited facts of this order, while the field of experimental psychology is opened up still wider to those who have learned to respect and apply its methods, with no necessity for neurological science to "begin over again," as Claude Bernard is reported to have sadly feared during his last days on hearing of the first of the recent German studies of hypnotism.

The observations made on A. B. certainly do not favour the conjecture of Bain that "action from within is suspended" in this state, nor the theory of Dr. Hammond of New York, that the function of the cortex is "eliminated". It is true we cannot make even such approximate estimates as Exner assumes of the time of conducting impressions and impulses in the spinal cord;<sup>1</sup> but, making the most liberal allowance for spinal as well as for peripheral time, we find on record some 18 hundredths of a second in the normal and 10 in the abnormal state remaining as central or reduced brain-time, concerning the partitions of which, between the basal ganglion and the cortex, we have extremely few data for inference. The fact that, with certain subjects, stimuli, if sudden or monotonous, like abnormally long fixation, instead of causing irradiations of excitation in the nervous centres, according to Pflüger's law, or otherwise, are not diffused but accumulated and intensified, causing, *e.g.*, as in Charcot's subjects, muscular contractions to become permanent, and producing sometimes circumscribed tonic rigidity, naturally suggests that the normal power of resistance in certain vaso-motor centres controlling the blood-

<sup>1</sup> As is shown in Du Bois Reymond's *Archiv*, 1879, "Ueber die Abhängigkeit der Reaktionszeiten vom Ort des Reizes," by J. v. Kries and G. Stanley Hall.

supply of the brain is impaired, allowing increased vascularity, brain-blushing, or local erethism, which may also be assumed in explaining what athletes call getting the second breath, the blood being proportionately diminished in other parts of the brain. On this hypothesis an hypnotic subject would be one with an irritable habit of excessive action in these centres. Rosenthal's observation<sup>1</sup> that nitrate of amyl arrests hypnotism, is not inconsistent with this hypothesis, which on the whole is more favourable to the theory of restricted diffusion of stimulus within the highly vascular centre than to the automatist's view that only lower centres are active in the hypnotic state.

Behind the circulatory is of course always the molecular aspect of the cerebral changes, which Tamburini thinks should be chiefly regarded in judging the various degrees of this state from gaze to coma. Except Wundt's inference from his studies of reflex action, that the excitatory is preceded by an inhibitory stage of cell-action, and the fact that the vigour of cell-action, and perhaps the evolution of heat, does not coincide with the increase of blood-supply, very little is known here. In the dread of admitting the study of psychoses into physiology, we may speak of the "lability" of passion and irrepressible volition, or of the erethism of temper and that too with real and increasing advantage; but in the study of our central question, *viz.*, what were all the causes which enabled our subject to reduce his reaction-time from 18 to 10 hundredths of a second, it simply shows lack of intelligence to ignore the psychological or subjective side of the problem.

From this side science, and indeed apperceptive as distinct from associative thought in general, may be described as the power of correlating and intensifying certain impressions by dichotomising and crowding off irrelevancies. Yet if certain large tracts of thought are sunk in forgetfulness or torpid indifference, others are apt to be uncritically over-estimated or morbidly dwelt upon often up to the point of illusion. If the sphere of ideas is unnaturally restricted or morbidly contracted, selfishness and egoism or mono-ideism, often deepening into positive insanity, are liable to result. Certain concentrative kinds of mental alienation—and our age of specialities seems particularly to favour forms of monomania—coexist with permanent or transient species of inhibition of normal motor reactions or various degrees of anaesthesia. The depth of sleep and abstraction may be measured by the

<sup>1</sup> See *Centralblatt für Nervenheilkunde*, 1882, p. 89.

intensity of the sensuous stimulus required to arouse us from them, and when a department of the various stimuli which, as they crowd in along all the sensory nerves, keep the various psychic elements awake, ceases to affect consciousness, its equilibrium is disturbed, and illusions are unrepressed. Anxiety in "labile" dispositions is apt to sharpen into localised pain. If we concentrate attention upon an image at the centre of the field of vision, its peripheral tracts seem to grow dark, as indeed does the centre itself with some observers, when the attention is fixed on a point in indirect vision. When A. B. was directed from the work of reaction to another entirely different subject by the operator, flushing, palpitation, and powerful psychic excitement were caused; he must always be roused into the normal state and again hypnotised before impressions of a new genus were given, as indeed was generally the practice with the exhibitor whom he attended, while within the limits of that genus great mobility of attention was common. All these facts and more or less current conceptions are in the general line of the hypothesis of a tonic cramp of the attention. So, too, are common curative and prophylactic measures, *e.g.*, preoccupation, interest and exercise for the idle, the same and music for the insane, rubbing a sore spot on the skin to dissipate the painful irritation, blowing in the face or a sharp tap upon a part of the body not concerned in the action, as a means of rousing from the hypnotic state, &c. Possibly, too, the case of another hypnotic subject who was able to bring down his reaction to 27 hundredths of a second in the normal, and only to 54 in the abnormal state, may be accounted for by assuming that the work of reacting could not with him be brought out of the negative field into the focus of attention. Five abnormal reactions of this second subject were excluded because delayed over an entire second. The attention of this subject appeared to be too concentrated on the person of the hypnotiser to fully comprehend the action desired.

But while the attention-theory has much explanatory power, and may enable us to regard many abnormalities and neural disorders as only exaggerations of states familiar to every normal mind, and while it enhances our conception of the power of the mind over the body, it is time to remember that there is yet much obscurity and confusion and great inadequacy about it. Shall we say that the hypnotised animals of Kircher, Czermak, and Preyer were suffering not from fear but from an abnormal concentration of attention in which animals have been thought to be deficient? Do hibernating animals



and the fakirs, who present phenomena which Braid and others since have regarded as belonging to the same category, simply hypnotise themselves, and do the East Indian ecstasies, and even hibernating animals, fixate their navel in passing into trance only because it is at a convenient distance for easy accommodation, and because they have not one of Heidenhain's buttons at hand? In cataleptic states, as has been lately shown by Rieger,<sup>1</sup> contractile energy is more evenly distributed between flexor and extensor muscles than in ordinary motion, antagonistic muscles being stimulated at the same time. Again, how shall we explain the imitative diseases which Hecker has described as psychic pests, and which present so many elements in common with hypnotism? It has been said that not only another's yawn, but even opening a pair of tongs will cause yawning, while if we bethink ourselves this stimulus is ineffective. When the hypnotic subject pronounces long foreign sentences correctly after his controller, &c., is the attention turned on, or is the action purely automatic and unconscious; and does hypnotic colour-blindness fall within the positive or negative field of attention? When, *e.g.*, a hand is made insensitive to pain, is it due to abnormally intense inhibition of sensation or motion by consciousness, or is it better conceived as an entire detachment and vagrancy of attention from consciousness, of which it is commonly conceived only as a concentration. Does life cultivate the mind only in spots or nodes, and are these so imperfectly bound together by associative and apperceptive processes that special stress upon one of them causes it to isolate itself still more till the power of self-direction is lost, and devolution and disintegration slowly supervene? Ablation of the cerebral hemispheres, as is well known, makes some animals hypersensitive reflex machines, as are some hypnotics, but surely this must destroy any rudimentary power of attention the animal may possess. Consciousness seems to be of many degrees, and total unconsciousness in men is probably rare even in syncope, coma, &c., and can of course never be proven—a matter of much importance for forensic medicine; and when our hypnotic subjects forget their names and cannot be made to recognise the presence of wife or husband, shall we assume without further question a concentration of consciousness in some other direction? Inhibition is often active as well as

<sup>1</sup> See "Ueber Hypnotismus" in *Sitzungsberichte der physik-med. Gesellschaft zu Würzburg*, 1882, s. 31; also, "Ueber normale u. kataleptische Bewegung" in *Archiv für Psychiatrie*, xiii., 2, 427.

voluntary, and it is not conceived as merely the negative side of a concentration of psycho-physical energy. What is wanted now is the careful and prolonged *psycho-physical study of individual cases* both of hypnotism proper and of allied states, including even hysteria in its myriad forms. If Attention be an essential factor in these abnormal states, it is evident that they take on as countless forms as it has directions and modes of movement and concentration. But we cannot consider this conception of hypnotism as by any means established as yet. Not only does it as yet fail to explain many facts, but it can hardly be brought to do so without quite radically reconstructing the notion of it familiar to common consciousness, and thus weakening its explanatory power—in some such way as Schopenhauer, Hartmann, Hegel, Fichte, and others, in trying to include the universe under the single categories of Will, Unconsciousness, Reason and Ego respectively, have confused these important conceptions. However it may be in other domains of philosophy, the psychologist who confesses to any one predominant rubric or system is an idolater, in whom abnormal mono-ideism has already begun its negative as well as its positive concentrative mischief.

To the consideration of some of the above problems and difficulties we hope to return later, in the light of studies already in progress. Meanwhile the writer desires to express his obligations to Professor H. P. Bowditch, of the Harvard Medical School, in Boston, for placing the resources of the Physiological Laboratory at his disposal, and for valuable aid and counsel.

G. STANLEY HALL.

*November 6th, 1882.*

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